



## Vehicle Technologies Program

# Powering Tomorrow's Vehicles



### Reducing Oil Dependence

**T**oday, America imports more than half of the oil we consume, 69 percent of which is used for transportation. Unless action is taken, the historical trend toward increasing dependence on foreign oil will continue.

Research and development undertaken by the U.S. Department of Energy's Vehicle Technologies Program is helping change this trend.

### The Vehicle Technologies Program

The Program includes two government/industry R&D

partnerships, the *FreedomCAR and Fuel Partnership* (CAR = *Cooperative Automotive Research*) and the *21st Century Truck Partnership*. The *FreedomCAR and Fuel Partnership* is a collaborative effort among the U. S. Council for Automotive Research, five energy companies and DOE for pre-competitive research on automotive technologies with potential to reduce oil consumption. Special emphasis is given to developing hybrid electric vehicles (HEV) and combustion technologies for near term use, as well as fuel cell

and hydrogen fuel technologies for the long term.

*The 21st Century Truck Partnership* concentrates on commercial vehicles. This partnership involves key members of the commercial highway vehicle industry, e.g. truck equipment and engine manufacturers and three other federal agencies: the U.S. Environmental Protection Agency, U.S. Department of Transportation and U.S. Department of Defense. Research concentrates on improving combustion engines and developing fuels for higher

efficiency and oil displacement, as well as reducing the amount of energy lost to various devices and equipment. These are expected to improve the energy efficiency of highway freight transportation.

### Staying at the Technological Cutting Edge

The areas of R&D addressed by the Program include:

**Vehicle Systems** - This subprogram addresses simulation and validation of advanced passenger and commercial vehicles to evaluate fuel economy and emissions and also funds R&D on technologies that effect heavy-vehicle systems (especially aerodynamic drag and parasitic energy losses).

**Innovative Concepts and Advanced Vehicle Competitions**- The Innovative Concepts subprogram supports curriculum development and training of the next generation of automotive engineers, providing research fellowships for 25 students through the Graduate Automotive Technology Education effort. The Advanced Vehicle Competitions activity allows college students to learn about and use new, emerging technologies through intercollegiate vehicle competitions.

**Hybrid and Electric Propulsion** - This subprogram funds R&D for hybrid electric passenger vehicles, with an emphasis on batteries, power electronics, electric motors and hybrid system integration.

**Advanced Combustion and Fuels** - these subprograms work in concert to improve combustion engine efficiency, develop fuels to enable very high efficiencies and low emissions and develop fuel blends with renewable components to displace petroleum.

**Materials** - this R&D emphasizes two areas, developing better materials for reducing vehicle weight and therefore lowering the energy requirements of passenger vehicles and improving

materials that contribute to higher efficiency engines and electric drive systems of both passenger and commercial vehicles.

These critical technologies can lead to oil savings when used in advanced combustion hybrid electric vehicles; they are also the foundation for the hydrogen fuel cell hybrid vehicles of tomorrow. The Program also seeks to educate the public about the benefits of these new technologies.

### A Promising New Addition

In January's 2006 State of the Union address, President Bush announced the Advanced Energy Initiative, which complements the FreedomCAR and Fuel Partnership. Going forward, Vehicle Technologies will emphasize research needed for "plug-in" hybrid electric vehicles (PHEVs) such as lower-cost, high-energy batteries.

Plug-in hybrid electric vehicles would look and perform much like regular cars, but have a high energy battery that can be charged from an electrical outlet. Plug-ins will run on the stored energy for much of a typical day's driving -- depending on the size of the battery -- up to 40 miles per charge, satisfying the daily commuting needs of many Americans. When the charge is consumed, the vehicle reverts to a standard hybrid mode, automatically running on the fuel in the fuel tank and energy recovered during braking. When fully developed, PHEVs could substantially increase the effective fuel efficiency of hybrid vehicles and greatly reduce our nation's need for oil.

### Significant Savings Potential

- America's highway transportation is 97 percent dependent on oil, a growing portion of which is imported; overall, American transportation (including aviation) is 95 percent dependent on oil
- Oil imports—a major component of balance of trade accounts—are

projected to account for more than \$170 billion of our nation's trade deficit by 2020

- Reducing highway oil use has more potential to improve the nation's energy security than any other action; even a one percent improvement in vehicle fuel efficiency would save consumers over \$2 billion annually



### A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.



U.S. Department of Energy

### Energy Efficiency and Renewable Energy

Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

July 2006